# Scope & Sequence

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| Course Name: Welding I **TSDS PEIMS Code:** 13032300 | | | **Course Credit:** 2.0  **Course Requirements:** This course is recommended for students in grades 10-12.  **Prerequisites:** none.  **Recommended Prerequisites:** Algebra I, Principles of Manufacturing, Introduction to Precision Metal Manufacturing, or Introduction to Welding. |
| **Course Description:** Welding I provides the knowledge, skills, and technologies required for employment in metal technology systems. Students will develop knowledge and skills related to this system and apply them to personal career development. This course supports integration of academic and technical knowledge and skills. Students will reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for future success. | | | |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. | | | |
| **Total Number of Periods**  **Total Number of Minutes**  **Total Number of Hours** | 350 Periods  15,750 Minutes  262.5 Hours\* | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. | |

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| **Unit Number, Title, and Brief Description** | **# of Class Periods\***  (assumes 45-minute periods)  Total minutes per unit | **TEKS Covered**  **130.363. (c) Knowledge and skills** |
| **Unit 1: Academic Knowledge and Skills for Manufacturing**  This unit will include lessons on terminology and skills that are associated with mathematics and science knowledge specifically pertaining to welding. Students will focus on understanding, interpreting, analyzing and knowing how to correctly use units of measure, mathematics concepts, and science principles in order to solve problems. | 30 Periods  1,350 Minutes | (1) The student applies academic skills to the requirements of welding. The student is expected to:  (A) demonstrate effective communication skills with individuals from varied cultures such as fellow workers, management, and customers;  (B) demonstrate mathematical skills to estimate  costs;  (C) demonstrate technical writing skills related to work orders;  (D) apply accurate readings of measuring devices;  (E) use appropriate tools to make accurate measurements;  (F) compute measurements such as area, surface area, volume, and perimeter;  (G) solve problems using whole numbers, fractions, mixed numbers, and decimals;  (H) use various methods, including a calculator, to perform computations;  (I) perform conversions between fractions and decimals;  (J) perform conversions between standards units and metric units;  (K) calculate and apply the functions of angles such as using the Pythagorean Theorem; and  (L) diagram the parts of a circle |
| **Unit 2: Workplace Regulations, Safety & Compliance**  This unit will expose students to the important regulations and safety standards that are implemented within this industry. Students will learn that such practices are in place to manage resources to minimize losses and liabilities to businesses in the industry. During this unit students will acquire and apply basic knowledge of using and maintaining professional welding equipment. Students will identify materials and resources commonly used and recycled in welding. Students will demonstrate the proper use and care of Personal Protection Equipment (PPE) used in machining, sheet metal, and welding. | 30 Periods  1,350 Minutes | (2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:  (F) apply knowledge and skills to health and safety in the workplace as specified by appropriate governmental regulations  (4) The student evaluates the function and application of the tools, equipment, technologies, and materials used in welding. The student is expected to:  (A) operate welding equipment according to safety standards;  (B) identify and properly dispose of environmentally hazardous materials used in welding;  (C) explain the importance of recycling materials used in welding;  (D) choose appropriate personal protective equipment; and  (E) evaluate skills related to health and safety in the workplace as specified by appropriate governmental regulations |
| **Unit 3: Welding Fundamentals**  Students will identify and use welding symbols and read detailed drawings; sketches will include basic welding symbols for fillet, groove, spot, plug, flanged, and other basic welds. Students will demonstrate the use of elements within a detailed drawing and interpret welding symbols from a detailed drawing. Additionally, students will be able to identify and use the basic weld types, weld joints, and weld positions. | 30 Periods  1,350 Minutes | (3) The student understands welding joint design, symbols, and welds. The student is expected to:  (A) demonstrate knowledge of engineering drawings, charts, and diagrams;  (B) interpret orthographic and isometric views of three-dimensional figures;  (C) interpret engineering, drawings, charts, and diagrams;  (D) analyze components of the welding symbol;  (E) identify types of welding joints;  (F) identify positions of welding; and  (G) identify types of welds such as fillet, groove, spot, plug, and flanged  (6) The student analyzes the concepts and intricacies of inspections and related codes. The student is expected to:  (A) explain weld inspection processes; and  (B) interpret welding codes |
| **Unit 4: Oxy-Fuel Cutting**  Students will be able to identify and explain, oxy-fuel cutting. Students will demonstrate the safe setting up and disassembly process of oxy-fuel, propane, propylene, and Chemtane 2® equipment. Students will demonstrate lighting, adjusting, and making cuts with oxy-fuel. Students will be able to identify and understand some common hazards in oxy-fuel cutting. | 35 Periods  1,575 Minutes | (7) The student analyzes oxy-fuel cutting processes on carbon steels. The student is expected to:  (A) practice safe operating practices;  (B) perform safe handling of compressed gases;  (C) identify components of oxy-fuel gas cutting system;  (D) demonstrate proper set-up procedures for oxy- fuel cutting process;  (E) identify factors affecting oxy-fuel cutting of base metals;  (F) demonstrate proper cutting techniques such as piercing, straight line, and bevel;  (G) identify acceptable cuts; and  (H) evaluate alternative fuel gasses such as propane, propylene, and Chemtane 2® |
| **Unit 5: Plasma Arc Cutting**  Students will learn knowledge regarding plasma arc cutting. Students will be able to identify and demonstrate setting up plasma arc cutting equipment. Students will identify, explain, and demonstrate the proper processes, safety procedures, and fume extraction for plasma arc cutting. Students will demonstrate the skills required to perform various cuts with plasma arc on various materials, including steel, aluminum, and stainless steel. | 35 Periods  1,575 Minutes | (8) The student analyzes plasma arc cutting on metals. The student is expected to:  (A) use safe operating practices;  (B) demonstrate knowledge of the theories of plasma arc cutting;  (C) apply safe handling of compressed air supply;  (D) identify components of plasma arc cutting;  (E) demonstrate correct set-up procedure for plasma arc cutting;  (F) define cutting terms; and  (G) perform straight line, piercing, bevels, and shape cuts |
| **Unit 6: Shielded Metal Arc Welding (SMAW)**  Students will understand that Shielded Metal Arc Welding process (SMAW), commonly referred to as stick welding, derives the heat for welding from an electric arc established between a consumable stick electrode and the part to be welded. During this unit students will demonstrate knowledge of Shielded Metal Arc Welding (SMAW) including setting up of equipment. Students will identify and explain the American Welding Society (AWS) classification of wire. Students will identify, explain, and demonstrate the proper AWS codes for fillet weld quality performing fillet welds in the flat, horizontal, vertical, and overhead positions to AWS code through National Skills Education standards. | 35 Periods  1,575 Minutes | (9) The student analyzes shielded metal arc welding principles and practices on metals. The student is expected to:  (A) use safe operating practices;  (B) analyze welding current relationships such as alternating current and direct current, heat transfer, and polarity;  (C) apply shielded metal arc welding principles;  (D) demonstrate proper set-up procedure for shielded metal arc welding;  (E) explain the American Welding Society (AWS) identification system for shielded metal arc welding electrodes;  (F) determine appropriate electrodes for base metal in shielded metal arc welding; and  (G) perform multi-pass groove welds in all positions according to industry-accepted welding standards. |
| **Unit 7: Gas Metal Arc Welding**  Students will learn and understand that Gas Metal Arc Welding (GMAW) is a process in which an electric arc forms between a consumable wire electrode and the workpiece metal(s), which heats the workpiece metal(s), causing them to melt and join; GMAW eliminates any need for a welding rod. Students will use appropriate equipment for safe operating practices for base metal in gas metal arc welding. Students will identify, explain, and demonstrate the proper AWS codes for fillet weld quality performing fillet welds in the flat, horizontal, vertical, and overhead positions to AWS code. | 35 Periods  1,575 Minutes | (10) The student analyzes gas metal arc welding principles and practices. The student is expected to:  (A) use safe operating practices;  (B) explain the effects that weld angle, work angle, and electrode extension have on welds;  (C) apply gas metal arc welding principles;  (D) demonstrate proper set-up procedure for gas metal arc welding;  (E) explain the AWS identification system for gas metal arc welding filler metal;  (F) determine appropriate filler metal for base metal in gas metal arc welding; and  (G) perform fillet and groove welds in all positions |
| **Unit 8: Fluxed Core Arc Welding**  The unit on Fluxed Core Arc Welding (FCAW) includes the identification of the welding machine and parts along with the safe and proper use of the machines in the lab environment. This unit will incorporate the use of the machine to weld test coupons and construct welded projects. Students will understand that FCAW requires a continuously-fed consumable tubular [electrode](https://en.wikipedia.org/wiki/Electrode) containing a [flux](https://en.wikipedia.org/wiki/Flux_(metallurgy)) and a constant-[voltage](https://en.wikipedia.org/wiki/Voltage) or, less commonly, a constant-[current](https://en.wikipedia.org/wiki/Electric_current) [welding power supply](https://en.wikipedia.org/wiki/Welding_power_supply). Students will identify, explain, and demonstrate the proper AWS codes for fillet weld quality performing fillet welds in the flat, horizontal, vertical, and overhead positions to AWS code. | 35 Periods  1,575 Minutes | (11) The student analyzes flux cored arc welding principles and practices on metals. The student is expected to:  (A) use safe operating practices;  (B) explain the effects that weld angle, work angle, and electrode extension have on welds;  (C) apply flux cored arc welding principles;  (D) demonstrate proper set-up procedure for flux cored arc welding;  (E) explain the AWS identification system for flux cored arc welding electrodes;  (F) determine appropriate filler metal for base metal in flux cored arc welding; and  (G) perform fillet and groove welds in all positions |
| **Unit 9: Gas Tungsten Arc Welding**  Gas Tungsten Arc Welding (GTAW) is frequently referred to as TIG welding. TIG welding is a commonly used high quality welding process. TIG welding has become a popular choice of welding processes when high quality, precision welding is required.  In TIG welding an arc is formed between a non-consumable tungsten electrode and the metal being welded. Gas is fed through the torch to shield the electrode and molten weld pool. If filler wire is used, it is added to the weld pool separately. | 35 Periods  1,575 Minutes | (12) The student analyzes gas tungsten arc welding on metals. The student is expected to:  (A) use safe operating practices;  (B) analyze electrical welding current relationships such as alternating current and direct current, heat transfer, and polarity;  (C) identify the common types of tungsten and filler metals according to the AWS identification system;  (D) demonstrate proper set-up procedure for gas tungsten arc welding;  (E) perform fillet and groove welds in all positions; and  (F) perform welds on metals such as carbon steel, stainless steel, and aluminum |
| **Unit 10: Employability Skills**  This unit explores the professional standards and employability skills required by business and industry. Students will grow to understand that responsibility, time management, organization, positive attitude, and good character have a large impact on employability and job retention. Students will understand the professional ethics legal responsibilities pertaining to the welding industry. This unit will help students better understand the various career opportunities within the welding industry. Students will develop a career plan designed to achieve their career goals within this industry. This unit will help students better understand the various career opportunities within the welding industry. Students will focus on expanding their knowledge about the education, training, and/or certification required to obtain employment in the industry. Students will develop a career plan designed to achieve their career goals within this industry. | 25 Periods  1,125 Minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;  (B) convey written information that is easily understandable to others;  (C) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;  (D) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;  (E) choose the ethical course of action and comply with all applicable rules, laws, and regulations;  (F) review the fine, detailed aspects of both quantitative and qualitative work process and end products;  (G) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations;  (H) follow written and oral instructions and adhere to established business practices, policies, and procedures, including health and safety rules; and  (I) prioritize tasks, follow schedules, and work on goal-relevant activities in a way that uses time wisely in an effective, efficient manner |
| **Unit 11: Career & Professional Development**  This unit will help students better understand the various career opportunities within the welding industry. Students will focus on expanding their knowledge about the education, training, and/or certification required to obtain employment in the industry. Students will develop a career plan designed to achieve their career goals within this industry. | 25 Periods  1,125 Minutes | (2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:  (A) explore academic knowledge and skills required for postsecondary education;  (B) identify employers' expectations to foster positive customer satisfaction;  (C) demonstrate the professional standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;  (D) evaluate personal career goals; and  (E) communicate effectively with others in the workplace to clarify objectives |